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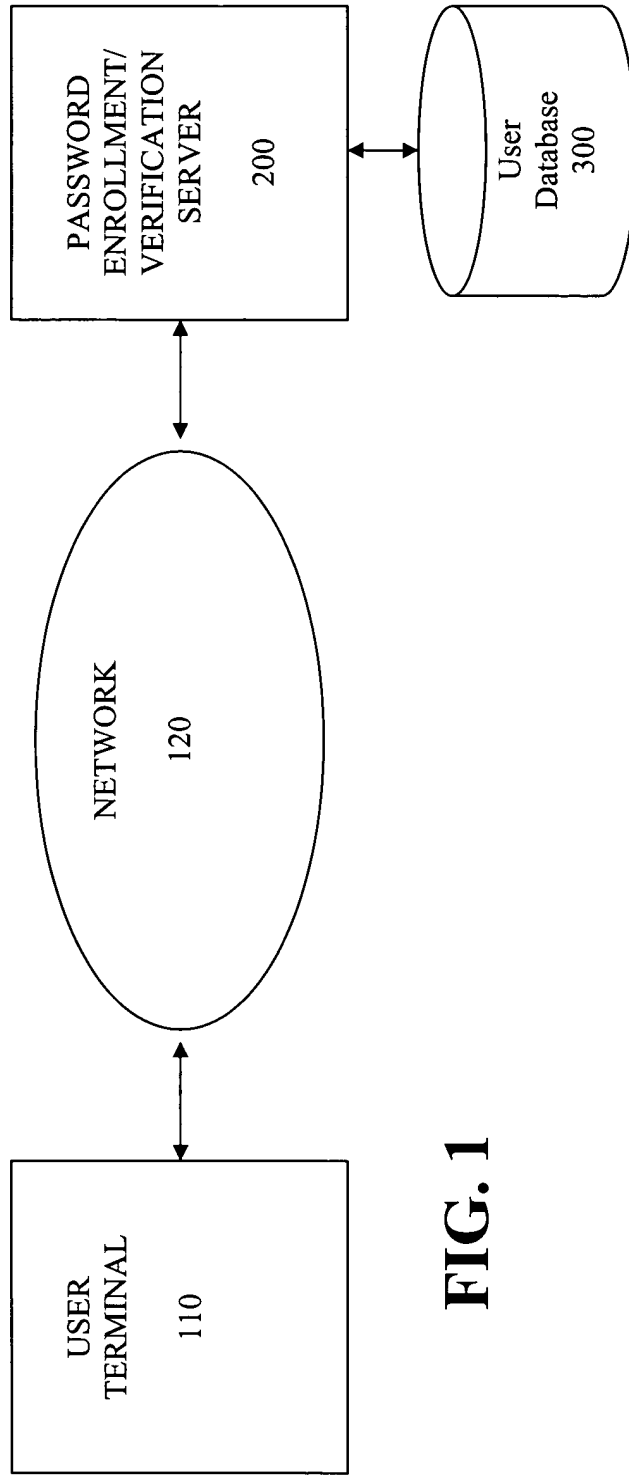
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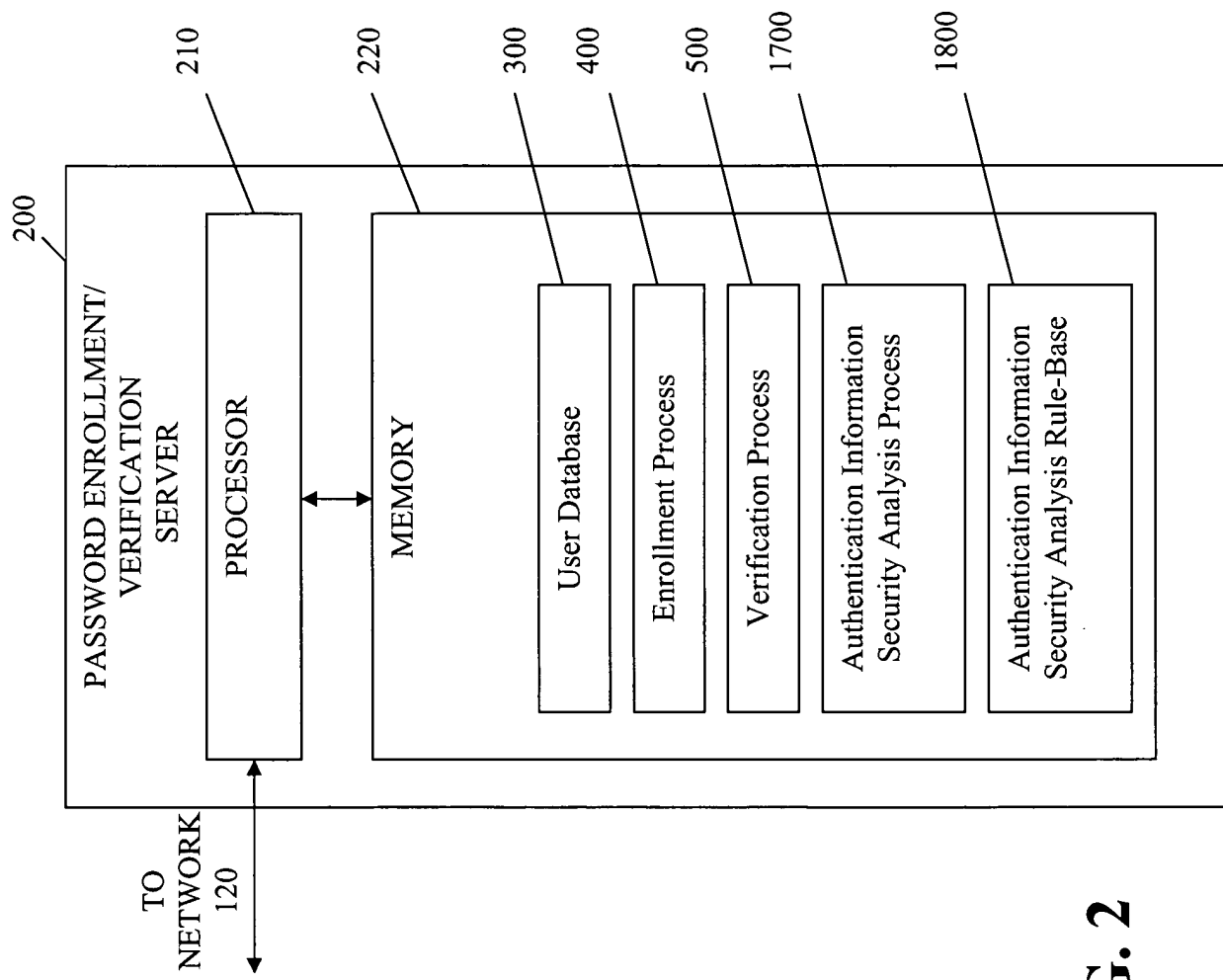
- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

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**FIG. 1**

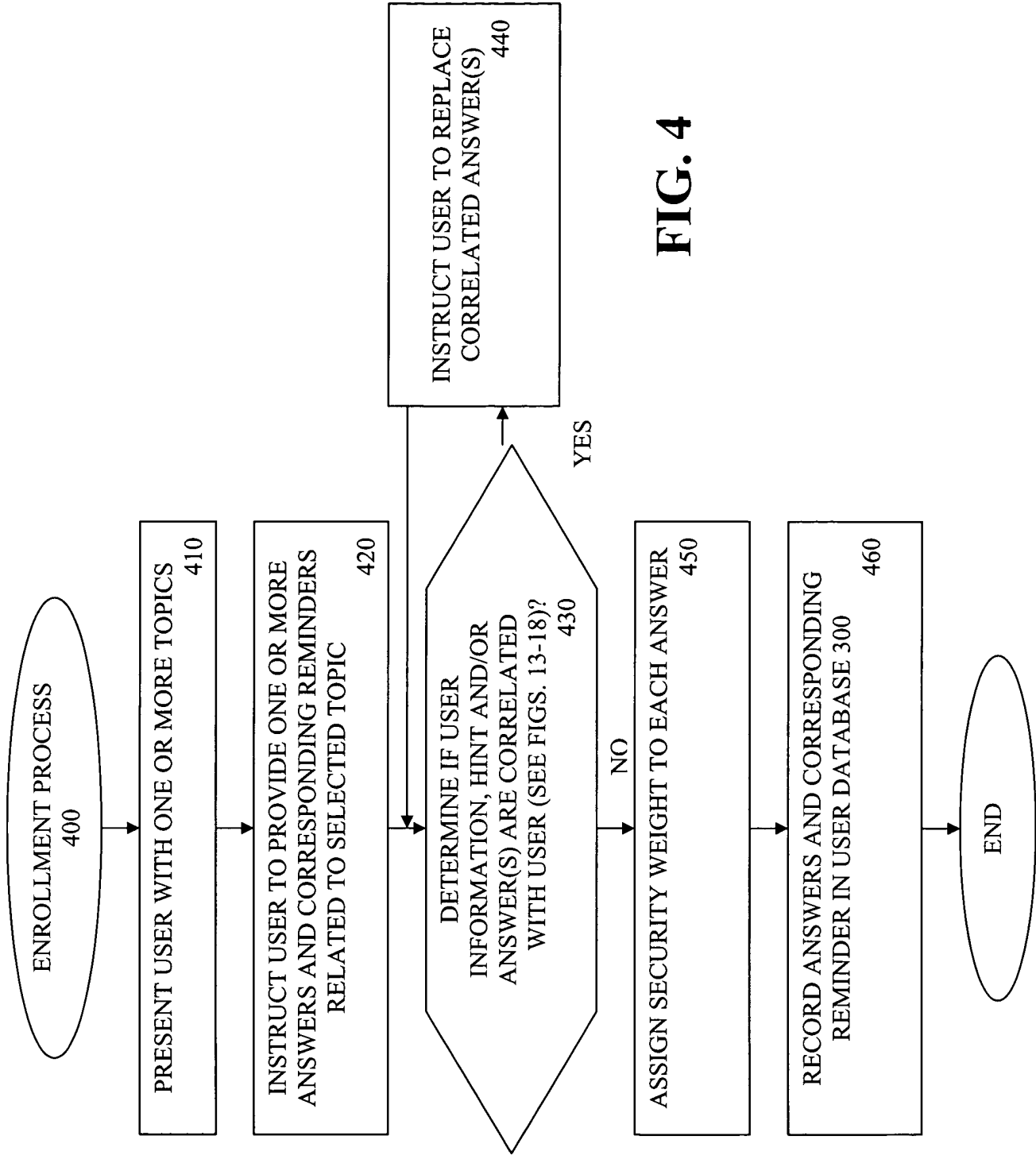


**FIG. 2**

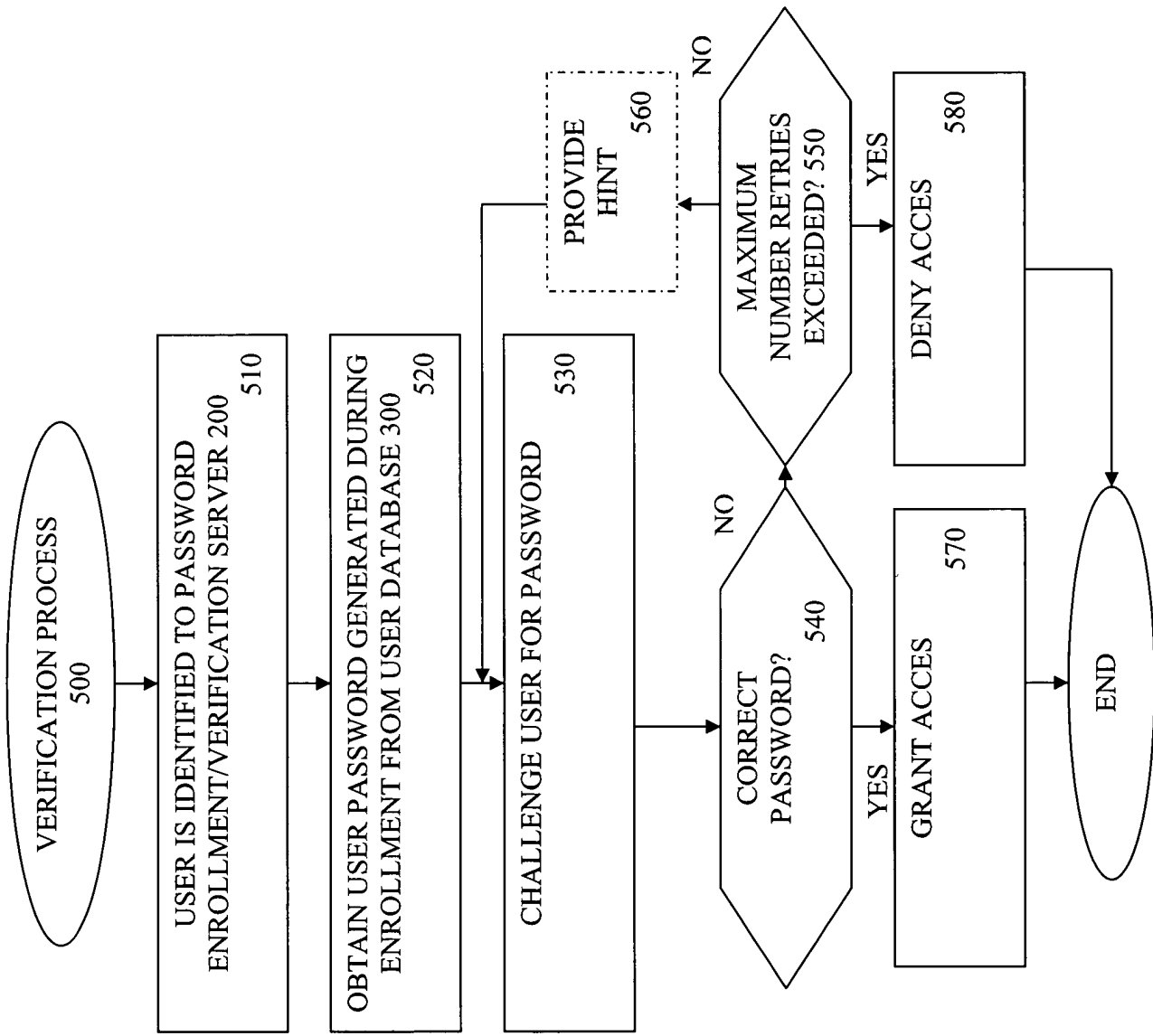
USER DATABASE -- 300

	USER NAME 330	PASSWORD (ANSWER) 340	REINFORCEMENT (HINT) 350
305	John Smith	718-555-1212	Mandy's Phone Number
310	...		
315	Jon Bentley	People: Father, Mother, Sister, Brother Car: Blue 1965 Mustang Trip: From Home to Fresno via Highway	Sandy Koufax's Perfect Game
320	Jill Doe	12/12/68	Fido's Owner's Birthday

FIG. 3



**FIG. 4**



**FIG. 5**

600

Authentication Registration - 03/20/2001

Exit

Welcome. This program will help you choose a "secret number" to identify yourself. Please choose one of the methods.

Personal History

Use this if you remember phone numbers, street addresses, and the like.

Key Events

Use this if you have vivid memory of past events, such as the First Moon Walk or the Tragedy of September 11, 2001.

Personal Preferences

Take a brief quiz about your likes and dislikes, then log in later by answering these questions.

Make Your Own Number

Make up your own secret number.

Random Number

The system will generate a secret number, and then help you memorize it.

610

FIG. 6

FIG. 7

700

Personal History

Try to find numbers that you know very well, yet are hard for attackers to discover.

Exit

Try this if you know many phone numbers.

Try this if you know street numbers, zip codes, or PO Box numbers.

Try this if you know important personal dates.

Try this if you know numbers such as the length, width or height of certain objects.

Try this if you once memorized an ID number that you no longer use.  
(Warning: Social Security numbers are not accepted.)

Try this for other numbers, such as model numbers, scores of sports events, etc.

Phone Numbers

Street Addresses

Dates

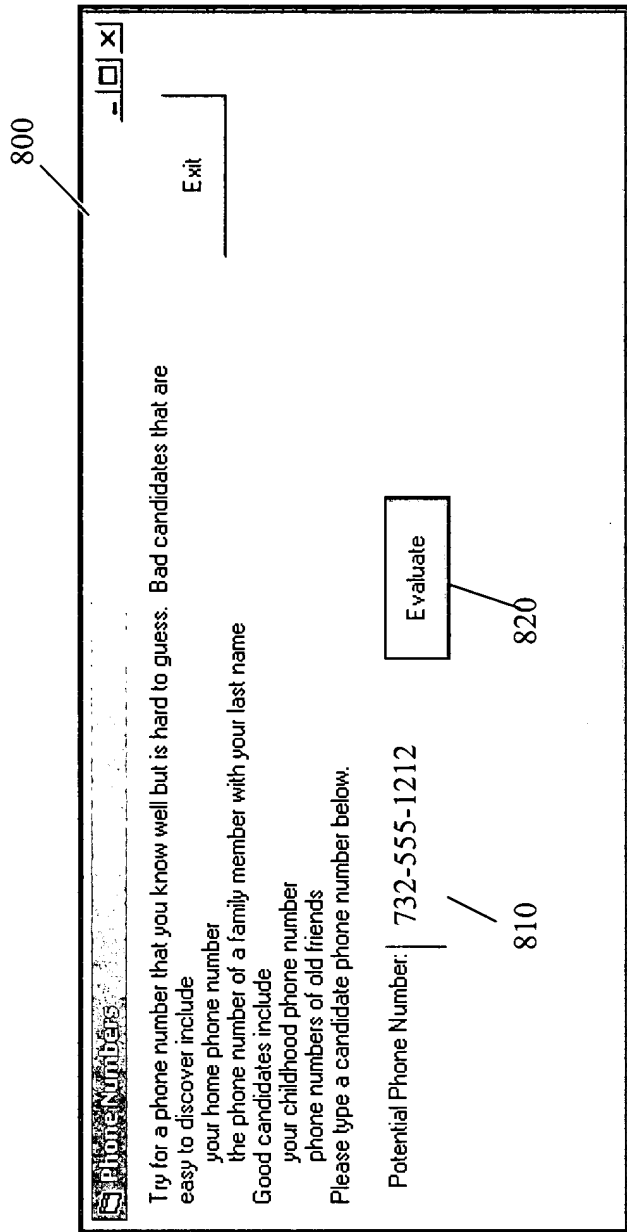
Numbers from Facts

Identification Numbers

Other Numbers



FIG. 8



Phone Number Text

Try to find a reminder that is easy for you to recognize yet hard for others to guess. Bad reminders that could help an attacker include  
Fred Jones in Boca Raton  
my brother in Aspen  
Good reminders mean a lot to you, but little to other people:  
Fluffy and Rover's house (pets' names)  
Susie and Jimmy's old house (children's names)  
If you can think of a good reminder, type it in below and press Evaluate.  
If you need help, press for assistance.

Phone Number: 718-555-1212  
Potential Reminder: Mandy's Phone Number  
Tests passed. 910  
If you are comfortable with this reminder, proceed to the next step.  
If you are not comfortable, try another reminder.

Evaluate

920

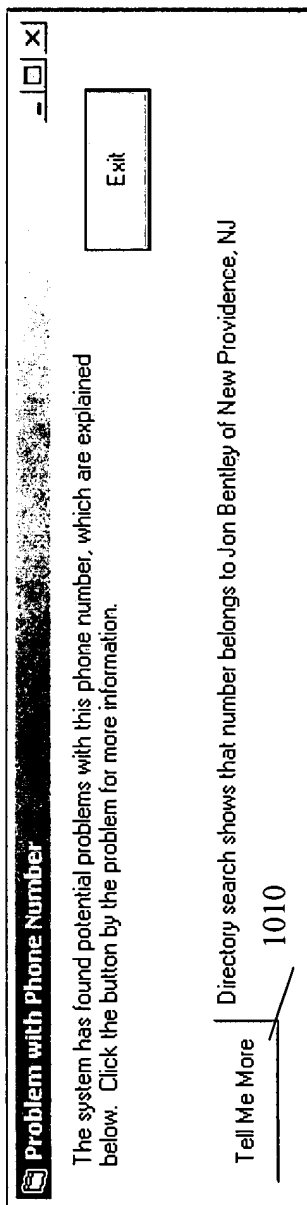
Finish the Process

Exit

FIG. 9

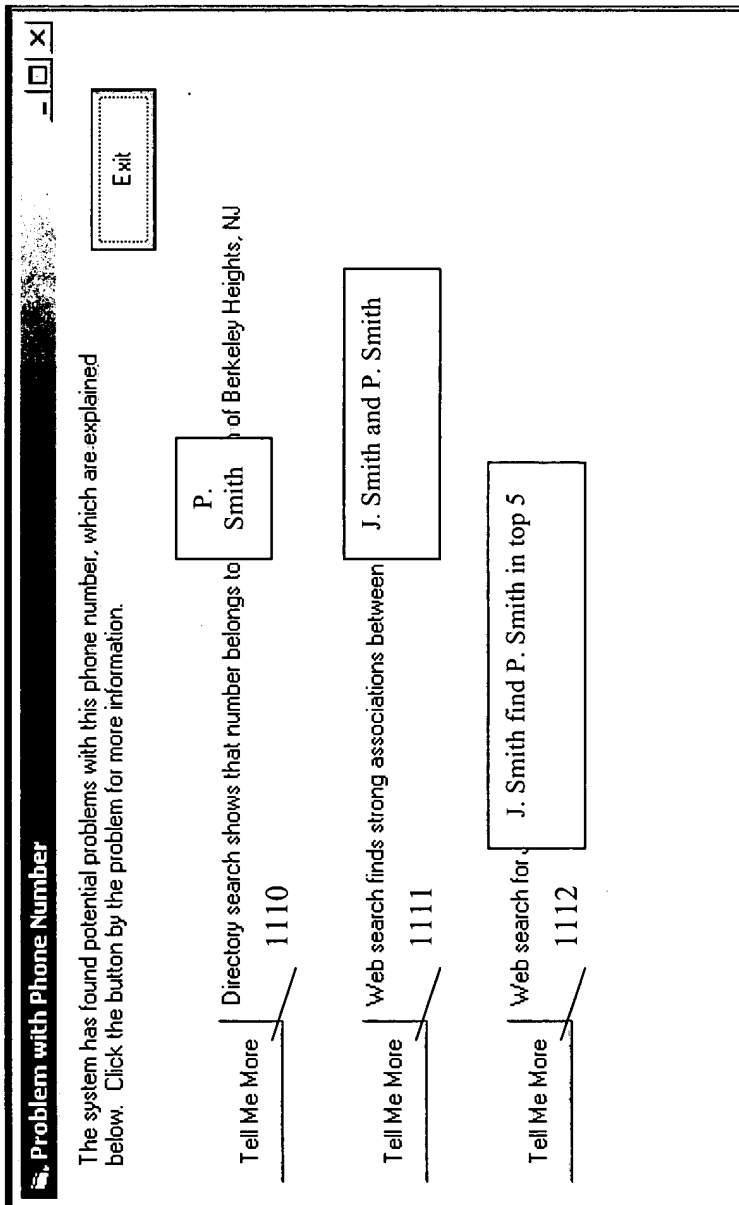
1000

FIG. 10



1100

FIG. 11



Registration Completion

Secret Number: 718-555-1212

Reminder: Mandy's phone number

1010

1020

Many people find it easier to remember their secrets if they receive periodic reminders. Please indicate below what, if any, reminders you wish to receive.

E-Mail Reminders

E-Mail Address: user@mail.adr

Frequency of Reminders

☐ Weekly

☒ Monthly

☐ None

1030

☐ Check here to receive the secret number along with the reminder.

Telephone Reminders

Telephone Number:

Frequency of Reminders

☐ Weekly

☐ Monthly

☒ None

1040

Telephone reminders do not give your secret numbers.

Exit

Done

FIG. 12

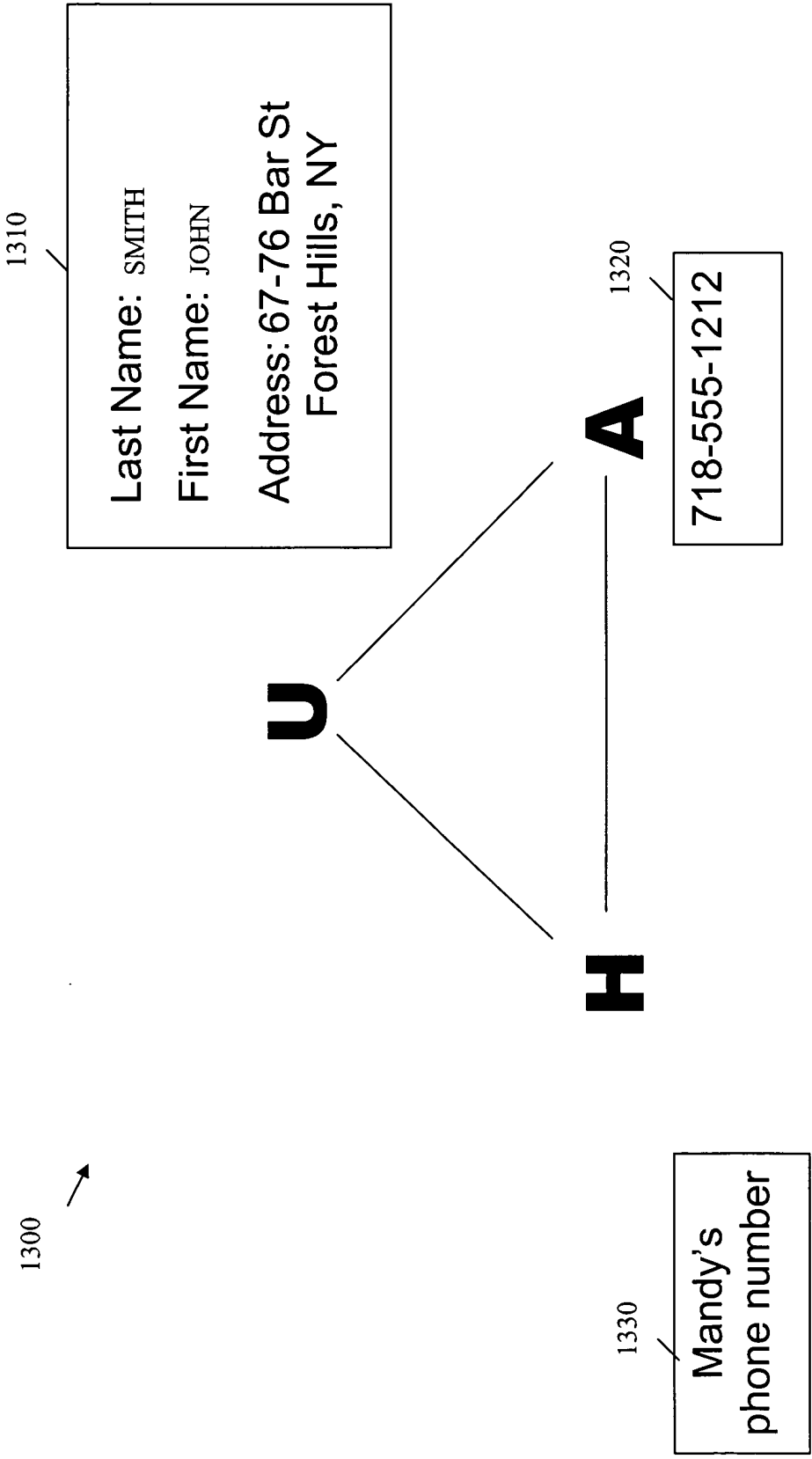
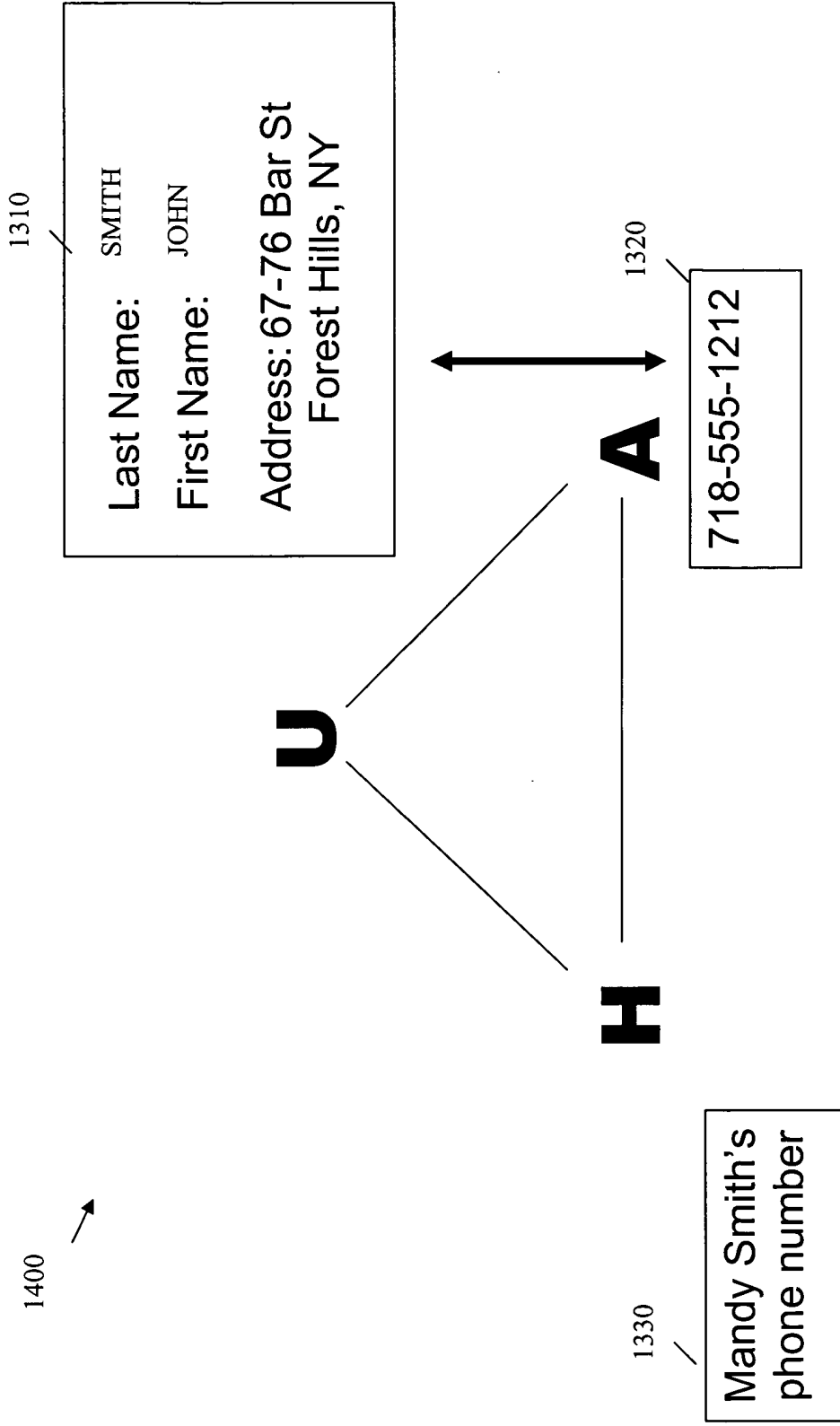


FIG. 13



**FIG. 14**

1500 →

1310

Last Name: SMITH  
First Name: JOHN  
Address: 67-76 Bar St  
Forest Hills, NY

**U**

**H**

**A**

1330

Mandy Smith's  
phone number

1320

718-555-1212

**FIG. 15**

1600



**U**

**H**

**A**

1330

Popular Airline's  
telephone number

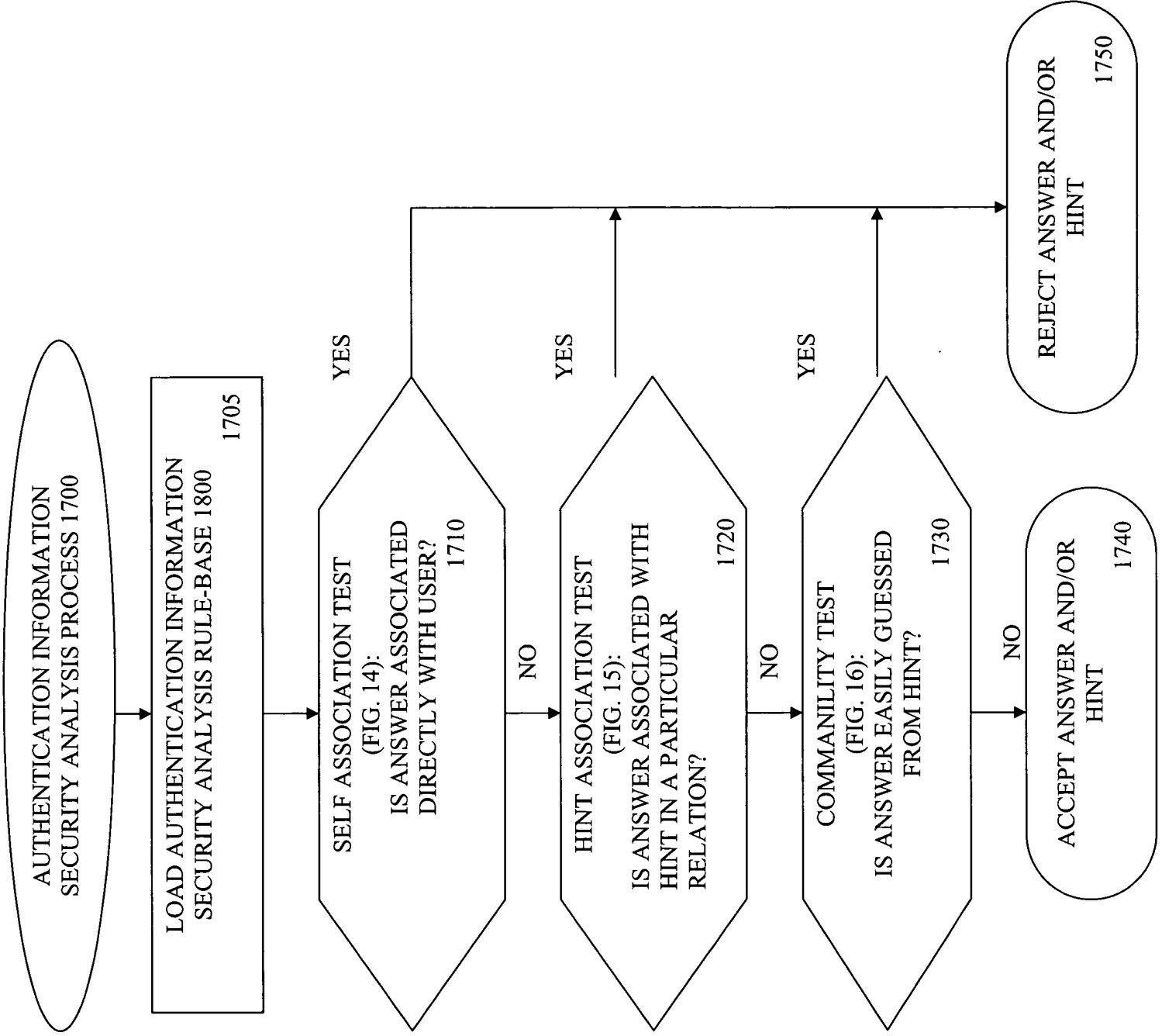
1320

800-221-1212

**FIG. 16**



FIG. 17



# AUTHENTICATION INFORMATION SECURITY ANALYSIS RULE-BASE 1800

	Rule Name 1830	Rule Type	1840	Rule Condition(s) 1850
1810	User Telephone Number	Self Association		Is user owner of proposed telephone number?
1811	Word Association	Self Association		Is user strongly associated with proposed word?
1812	Hint Related to User	Hint Association		Is person associated with proposed hint in a particular relation with user?
...				
1820	Common Telephone Number	Commonality		Is popular business entity owner of proposed telephone number?

FIG. 18

	<none>	compilers	pearls	image
Author A	13400	8560 64%	174 1%	921 7%
Author B	10700	480 4%	4670 44%	692 6%
Author C	2110	34 2%	3 0%	915 43%

FIG. 19